****** CONFIDENTIAL ******
******PRE-DECISIONAL DOCUMENT ******
****** SUMMARY SCORESHEET ******
****** FOR COMPUTING PROJECTED HRS SCORE ******

****** Do Not Cite or Quote ******

Site Name: Lorraine Refinery

Region: 6

City, County, State: Bristow, Creek OK

Evaluator: Vanessa Peterson

EPA ID#: OKN000606909

Date: 7/31/2009

Lat/Long: 30.842603/96.38585

T/R/S: 16N/9E/29

Congressional District: 3

This Scoresheet is for: SI

Scenario Name: Site Investigation

Description: To review information collected during site visits, sampling environmental media for determination of presence and extent of hazardous substances on-site and migration of these substances from the site, evaluating and documenting the Hazard Ranking System factors, and collecting additional non-sampling factors.

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	6.15	37.8225
Surface Water Migration Pathway Score (S_{sw})	61.07	3729.5449
Soil Exposure Pathway Score (S_s)	53.74	2887.9876
Air Migration Score (S_a)	3.80696727272727	14.4929998156165
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		6669.848
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		1667.462
$/ (S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		40.83

υ Pathways not assigned a score (explain):

9103136

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated: Pennsylvanian-aged Barnsdall Formation			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Containment	10	10	
2b. Net Precipitation	10	3	
2c. Depth to Aquifer	5	5	
2d. Travel Time	35	35	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	430	
3. Likelihood of Release (higher of lines 1 and 2e)	550		430
Waste Characteristics:			
4. Toxicity/Mobility	(a)	100	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		10
Targets:			
7. Nearest Well	(b)	9	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(b)	99	
8d. Population (lines 8a + 8b + 8c)	(b)	99	
9. Resources	5	5	
10. Wellhead Protection Area	20	5	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		118
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		6.15030303030303
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		6.15030303030303

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated:			
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	550	
2. Potential to Release by Overland Flow:			
2a. Containment	10	10	
2b. Runoff	10	1	
2c. Distance to Surface Water	5	25	
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35	260	
3.Potential to Release by Flood:			
3a. Containment (Flood)	10	10	
3b. Flood Frequency	50	7	
3c. Potential to Release by Flood (lines 3a x 3b)	500	70	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	330	
5. Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:			
6. Toxicity/Persistence	(a)	10000	
7. Hazardous Waste Quantity	(a)	100	
8. Waste Characteristics	100		32
Targets:			
9. Nearest Intake	50	0	
10. Population:			
10a. Level I Concentrations	(b)	0	
10b. Level II Concentrations	(b)	0	
10c. Potential Contamination	(b)	0	
10d. Population (lines 10a + 10b + 10c)	(b)	0	
11. Resources	5	5	
12. Targets (lines 9 + 10d + 11)	(b)		5
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		1.07
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	50000	
16. Hazardous Waste Quantity	(a)	100	
17. Waste Characteristics	1000		32
Targets:			
18. Food Chain Individual	50	0	
19. Population			
19a. Level I Concentration	(b)	0	
19b. Level II Concentration	(b)	0	
19c. Potential Human Food Chain Contamination	(b)	0	
19d. Population (lines 19a + 19b + 19c)	(b)	0	
20. Targets (lines 18 + 19d)	(b)		0
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		0
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	50000000	
24. Hazardous Waste Quantity	(a)	100	
25. Waste Characteristics	1000		180

Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	4000	
26b. Level II Concentrations	(b)	0	
26c. Potential Contamination	(b)	0	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	4000	
27. Targets (value from line 26d)	(b)		4000
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		60
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100}	100		61.07
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		61.07

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated:			
Drinking Water Threat			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Containment	10	10	
2b. Net Precipitation	10	3	
2c. Depth to Aquifer	5	5	
2d. Travel Time	35	35	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	430	
3. Likelihood of Release (higher of lines 1 and 2e)	550		430
Waste Characteristics:			
4. Toxicity/Mobility	(a)	100	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		10
Targets:			
7. Nearest Well	(b)	0	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(b)	0	
8d. Population (lines 8a + 8b + 8c)	(b)	0	
9. Resources	5	5	
10. Targets (lines 7 + 8d + 9)	(b)	5	
Drinking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0.260606060606061
Human Food Chain Threat			
Likelihood of Release:			
12. Likelihood of Release (same value as line 3)	550		430
Waste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	50	
14. Hazardous Waste Quantity	(a)	100	
15. Waste Characteristics	1000		6
Targets:			
16. Food Chain Individual	50		
17. Population			
17a. Level I Concentration	(b)	0	
17b. Level II Concentration	(b)	0	
17c. Potential Human Food Chain Contamination	(b)	0	
17d. Population (lines 17a + 17b + 17c)	(b)	0	
18. Targets (lines 16 + 17d)	(b)		0
Human Food Chain Threat Score:			
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,suject to max of 100]	100		0
Environmental Threat			
Likelihood of Release:			
20. Likelihood of Release (same value as line 3)	550		430
Waste Characteristics:			
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	50000	
22. Hazardous Waste Quantity	(a)	100	
23. Waste Characteristics	1000		32
Targets:			
24. Sensitive Environments			
24a. Level I Concentrations	(b)	75	
24b. Level II Concentrations	(b)	0	

24c. Potential Contamination	(b)	0	
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	75	
25. Targets (value from line 24d)	(b)		75
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		12.54
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score[c] (lines 11 + 19 + 28, subject to a max of 100)	100		12.8006060606061
28. Component Score (S_{gs})[c] (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		12.8006060606061

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Likelihood of Exposure	550		550
Waste Characteristics:			
2. Toxicity	(a)	10000	
3. Hazardous Waste Quantity	(a)	100	
4. Waste Characteristics	100		32
Targets:			
5. Resident Individual	50	50	
6. Resident Population:			
6a. Level I Concentrations	(b)	50	
6b. Level II Concentrations	(b)	0	
6c. Population (lines 6a + 6b)	(b)	50	
7. Workers	15	0	
8. Resources	5	0	
9. Terrestrial Sensitive Environments	(c)	150	
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		250
Resident Population Threat Score			
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)		4400000
Nearby Population Threat			
Likelihood of Exposure:			
12. Attractiveness/Accessibility	100	75	
13. Area of Contamination	100	20	
14. Likelihood of Exposure	500		50
Waste Characteristics:			
15. Toxicity	(a)	10000	
16. Hazardous Waste Quantity	(a)	100	
17. Waste Characteristics	100		32
Targets:			
18. Nearby Individual	1	0	
19. Population Within 1 Mile	(b)	21	
20. Targets (lines 18 + 19)	(b)		21
Nearby Population Threat Score			
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)		33600
Soil Exposure Pathway Score:			
22. Pathway Score[d] (S_s), [lines (11+21)/82,500, subject to max of 100]	100		53.74

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60
[d] Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Release:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Gas Potential to Release	500	360	
2b. Particulate Potential to Release	500	330	
2c. Potential to Release (higher of lines 2a and 2b)	500	360	
3. Likelihood of Release (higher of lines 1 and 2c)	550		360
Waste Characteristics:			
4. Toxicity/Mobility	(a)	8	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		3
Targets:			
7. Nearest Individual	50	0	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(c)	10.81	
8d. Population (lines 8a + 8b + 8c)	(b)	10.81	
9. Resources	5	0	
10. Sensitive Environments:			
10a. Actual Contamination	(c)	0	
10b. Potential Contamination	(c)	280	
10c. Sensitive Environments (lines 10a + 10b)	(c)	280	
11. Targets (lines 7 + 8d + 9 + 10c)	(b)		290.81
Air Migration Pathway Score:			
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100		3.80696727272727

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer